## REMARKS

In the office action, the Examiner required submission of an English language translation of Japanese Patent Application 2000-340068 prior to declaration of an interference. The present application claims priority to Japanese Patent Application 2000-340068. Attached hereto is a verified English language translation of the priority document for the Examiner's review. The Examiner is requested to enter and consider this document when considering patentability matters. If any further submissions are required to satisfy the Examiner's requirement, the undersigned requests clarification of the same.

Claims 1-9 are currently pending in the application. Claims 1 and 6 have been amended to clarify differences between the claimed invention and the references cited by the Examiner, as discussed below. Support for these amendments can be found in the Specification at: page 6, lines 5-7 and lines 19-22; page 7, lines 9-19; page 8, lines 9-16; and page 9, line 15 – page 10, line 13.

According to the claimed invention, normal operation system software is present in a distinct storage area 1A within a terminal device, while update data is downloaded to a storage area 1C within the terminal device until the update data is installed. The process of installing updates may thus be deferred until an appropriate time, which avoids problems of incorrect or incomplete downloads which may be associated with factors such as service interruptions. The claimed invention also provides for the use of pointers to define update data 308, 408 in terms of sequential data sets $308_1$, $308_2$, $308_3$, $408_1$, $408_2$, $408_3$, so that incorrect and incomplete downloads may be remedied by repeating the downloading of individual data sets instead of repeating the downloading of all of the update data.

Claims 1, 4, and 6-9 were rejected under 35 U.S.C. § 103(a) as unpatentable over U.S. Patent No. 6,687,901 B1 to Imamatsu in view of European Patent No. 0 802 694 A2 to Heidari. Claims 2-3 and 5 were rejected under 35 U.S.C. § 103(a) as unpatentable over Imamatsu in view of Heidari and in further view of U.S. Patent No. 6,658,247 B1 to Saito. Applicant respectfully traverses these rejections as

discussed below.

Claims 1, 4, and 6-9

Claims 1, 4, and 6-9 were rejected under 35 U.S.C. § 103(a) as unpatentable over Imamatsu in view of Heidari. This rejection is respectfully traversed on the basis that the combination of Imamatsu with Heidari would not result in the claimed invention. Imamatsu discloses a method and apparatus for updating software in a radio terminal device, wherein update software 203 is not stored before installation is begun but is instead downloaded through buffer memory 206 into the control software portion 204 of the device's main memory 202. The Examiner comments upon Imamatsu's use of a check sum to determine whether a program has been correctly downloaded without acknowledging that the Claims 4 and 8 claim an "operation test" not strictly limited to use of a check sum and without discussing the fact that the Imamatsu does not provide for error checking to be done prior to installation of the update. In addition, while the Examiner finds parallels between Imamatsu and Claims 6 and 7 of the claimed invention, the referenced passage from the disclosure of Imamatsu (column 15, lines 40-47) specifically refers to the use of a battery back-up RAM rather than storage, as in the claimed invention. The Examiner, implicitly acknowledging that Imamatsu does not discuss the storing of update data so that installation may be deferred until update data has been completely and correctly downloaded, relies on Heidari to provide the missing features. Heidari however, does not provide for the storage of update data to confirm that update data has been completely and correctly downloaded. Instead, Heidari discloses a remotely programmable mobile telephone in which two programs which may be used in the alternative are stored within the device in order to enable the mobile telephone to accommodate protocol and other requirements applicable to mobile telephone operation in a given time and place. According to Heidari, while a mobile telephone is using protocols stored in memory 66, a different set of protocols may be stored in a second program memory 68 so that the computer 58 may switch the protocols in memory 66 and the protocols in memory 68 to facilitate transitions in a cellular telephone system, such as the handing off of a mobile telephone from one cell using

one set of protocols to another cell using another set of protocols. Thus, while the Examiner finds parallels between the claimed invention and Heidari's disclosure of the use of a storage medium for programs or protocols (column 6, lines 1-14), Heidari does not disclose the downloading of update data into storage, with installation deferred until an appropriate time in order to address problems of incorrect or incomplete downloads and to ensure the update data has been received completely and correctly, as in Claims 1, 4, and 6-9.

Claims 1 and 6 are currently amended to place greater emphasis on the separate storage of update data and an existent program pending installation of the update. The rejection of Claims 1, 4, and 6-9 is traversed on the basis that the combination of Imamatsu and Heidari would not result in Claims 1, 4, and 6-9.

Claims 2-3 and 5

Claims 2-3 and 5, all of which depend from Claim 1, were rejected under 35 U.S.C. § 103(a) as unpatentable over Imamatsu in view of Heidari and in further view of Saito. Applicant traverses the rejection of these dependent claims for all of the reasons the rejection of base Claim 1 is traversed, as discussed above. Additional bases of traversal of the rejection of Claims 2-3 and 5 are provided in the following discussion.

Claims 2-3 and 5 describe methods wherein update data are divided into a plurality of data sets which are subsequently added with sequential pointers. As discussed above, Imamatsu discloses a method and apparatus in which updating software for a radio is downloaded by means of buffer memory, rather than being stored pending installation as in the claimed invention, while Heidari discloses a remotely programmable mobile terminal which stores multiple programs that may be used in the alternative, in order to enable the mobile telephone to switch from one set of protocols to another. Apparently recognizing that the combination of Imamatsu and Heidari would not result in Claims 2, 3, or 5 of the claimed invention, the Examiner has rejected the claims under 35 U.S.C. § 103(a) as unpatentable over Imamatsu in view of Heidari and in further view of Saito, which discloses a method and apparatus for receiving data with a portable telephone terminal. Where data such

as music data may be downloaded to a portable telephone terminal, Saito discusses problems that may arise when downloading is interrupted to enable the user to take a call. In order facilitate the interruption and subsequent restarting of music transmissions when calls are taken, and in order to facilitate packetization of music data for transmission via time-division multiple access systems and code-division multiple access systems, Saito provides for music data to be transmitted in blocks. Thus, when a new music title is downloaded, the value of load counter N and the value of bit counter M are initialized to zero at the beginning of the downloading process, to make is possible to keep track of the progress of downloading on a block-by-block basis. (Saito, Figures 4A, 4B, 4C, and 4D) The Examiner has taken the position that this feature of Saito, when viewed in combination with Imamatsu and Heidari, reads on the use of sequential pointers in Claims 2-3 and 5 of the claimed invention. Unlike Claims 2-3 and 5, however, Saito does not give consideration to problems associated with ensuring the completeness and correctness of downloaded update data prior to installation, which the pointers in Claims 2-3 and 5 are intended to address. As a result of this distinction, the combination of Imamatsu with Heidari and Saito would not result in the claimed invention. The rejection of Claims 2-3 and 5 is respectfully traversed.

## Conclusion

In view of the foregoing, Applicant submits that all of the claims are patentably distinct from the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue. The Examiner is invited to contact the undersigned at the telephone number listed below, if needed.

Applicant hereby makes a written conditional petition for extension of time, if required. Please charge any deficiencies in fees and credit any overpayment of fees to Attorney's Deposit Account No. 50-2041 (Whitham, Curtis & Christofferson).

Respectfully submitted,

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CUSTOMER NUMBER 30743

OIPE JC25 AUG 3 0 2004 PATENT & TRADEMARK OFFICE



FIG. 1

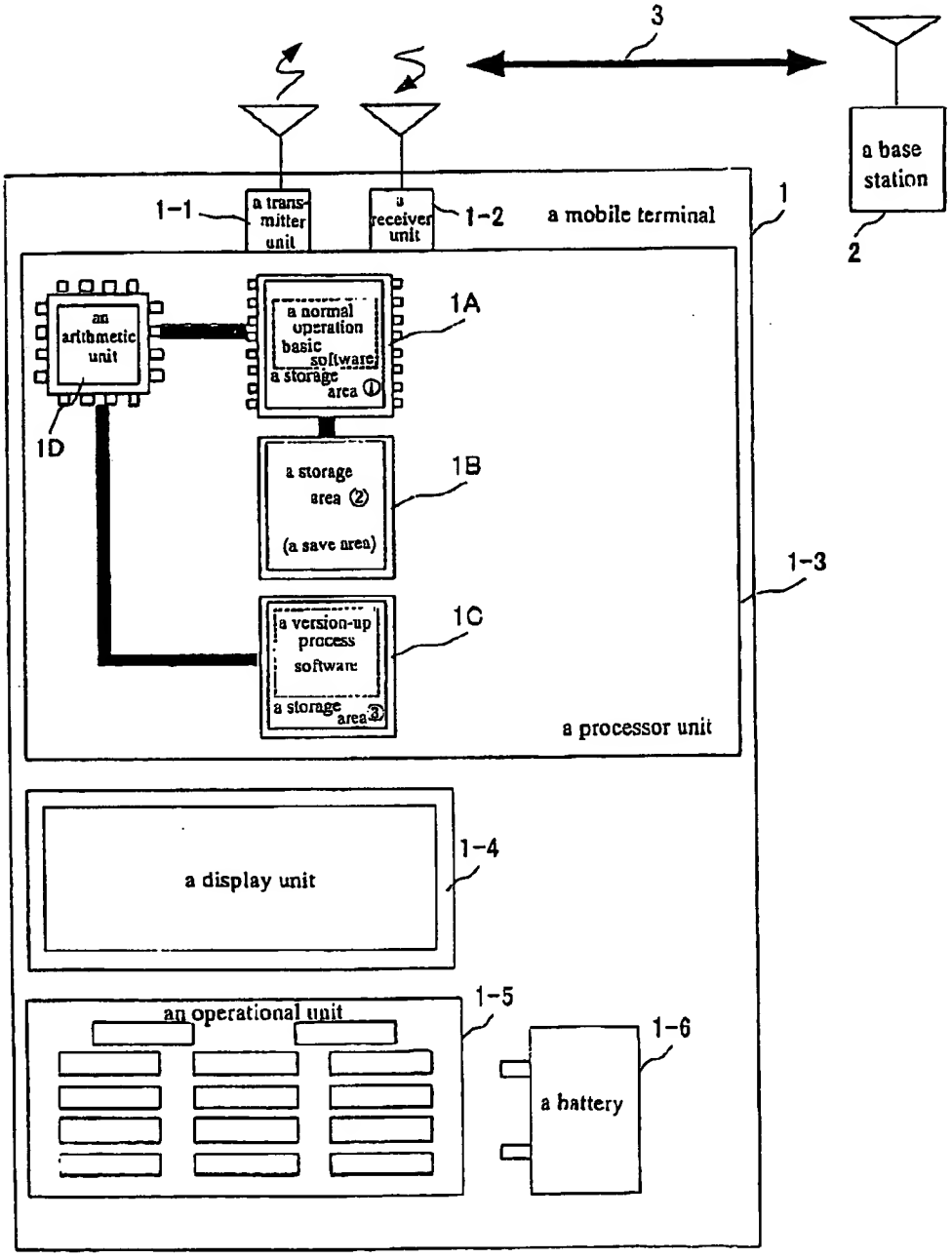
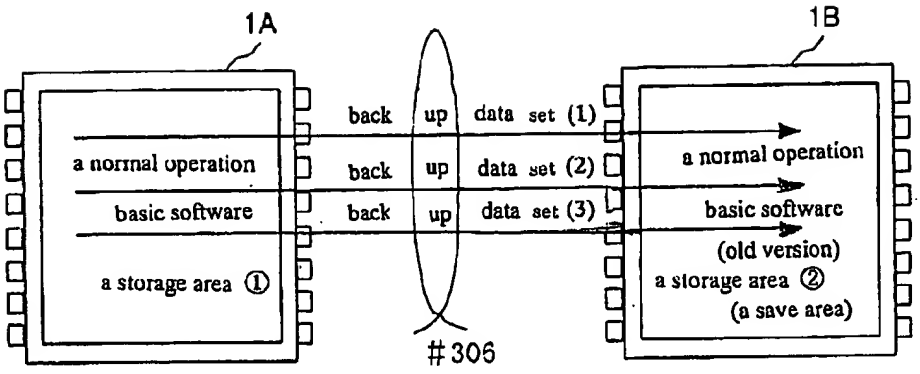


FIG. 2


1A
1B
back up data set (1)
back up data set (2)
back up data set (3)
a normal operation
basic software
a storage area ①
a normal operation
basic software
(old version)
a storage area ②
(a save area)
#306

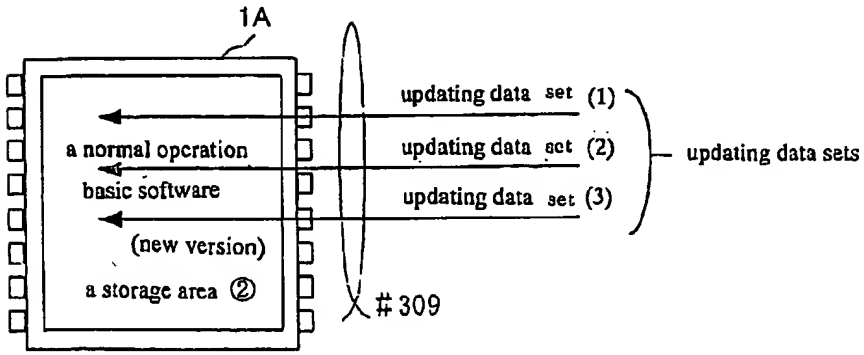

1A
updating data set (1)
updating data set (2)
updating data set (3)
updating data sets
a normal operation
basic software
(new version)
a storage area ②
#309

FIG. 3

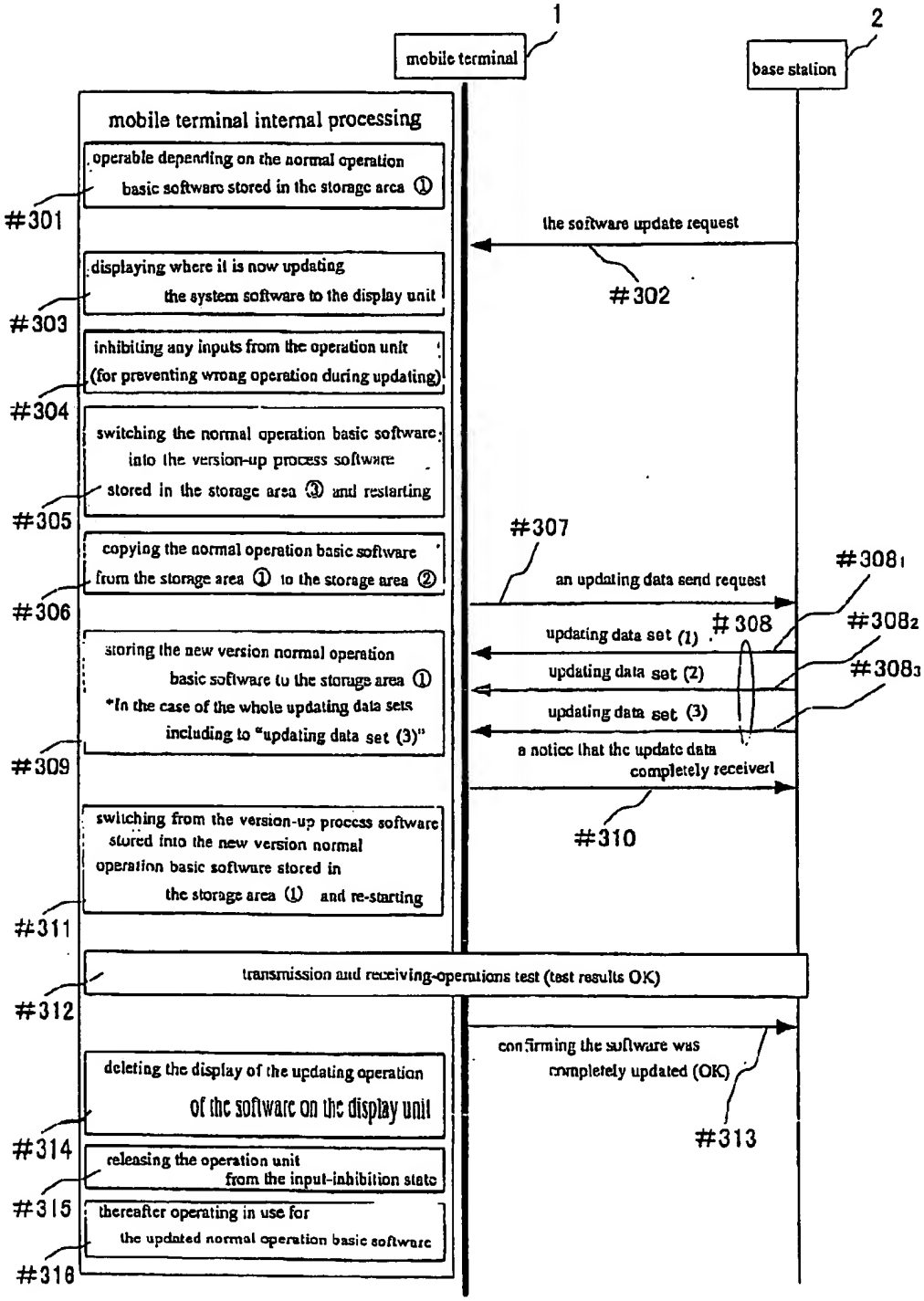

1
mobile terminal
2
base station
mobile terminal internal processing
operable depending on the normal operation basic software stored in the storage area ①
#301
the software update request
#302
displaying where it is now updating the system software to the display unit
#303
inhibiting any inputs from the operation unit (for preventing wrong operation during updating)
#304
switching the normal operation basic software into the version-up process software stored in the storage area ③ and restarting
#305
#307
copying the normal operation basic software from the storage area ① to the storage area ②
#306
an updating data send request
#308₁
#308
#308₂
updating data set (1)
storing the new version normal operation basic software to the storage area ①
*In the case of the whole updating data sets including to "updating data set (3)"
updating data set (2)
#308₃
updating data set (3)
#309
a notice that the update data completely received
#310
switching from the version-up process software stored into the new version normal operation basic software stored in the storage area ① and re-starting
#311
transmission and receiving-operations test (test results OK)
#312
confirming the software was completely updated (OK)
#313
deleting the display of the updating operation of the software on the display unit
#314
releasing the operation unit from the input-inhibition state
#315
thereafter operating in use for the updated normal operation basic software
#316

FIG. 4

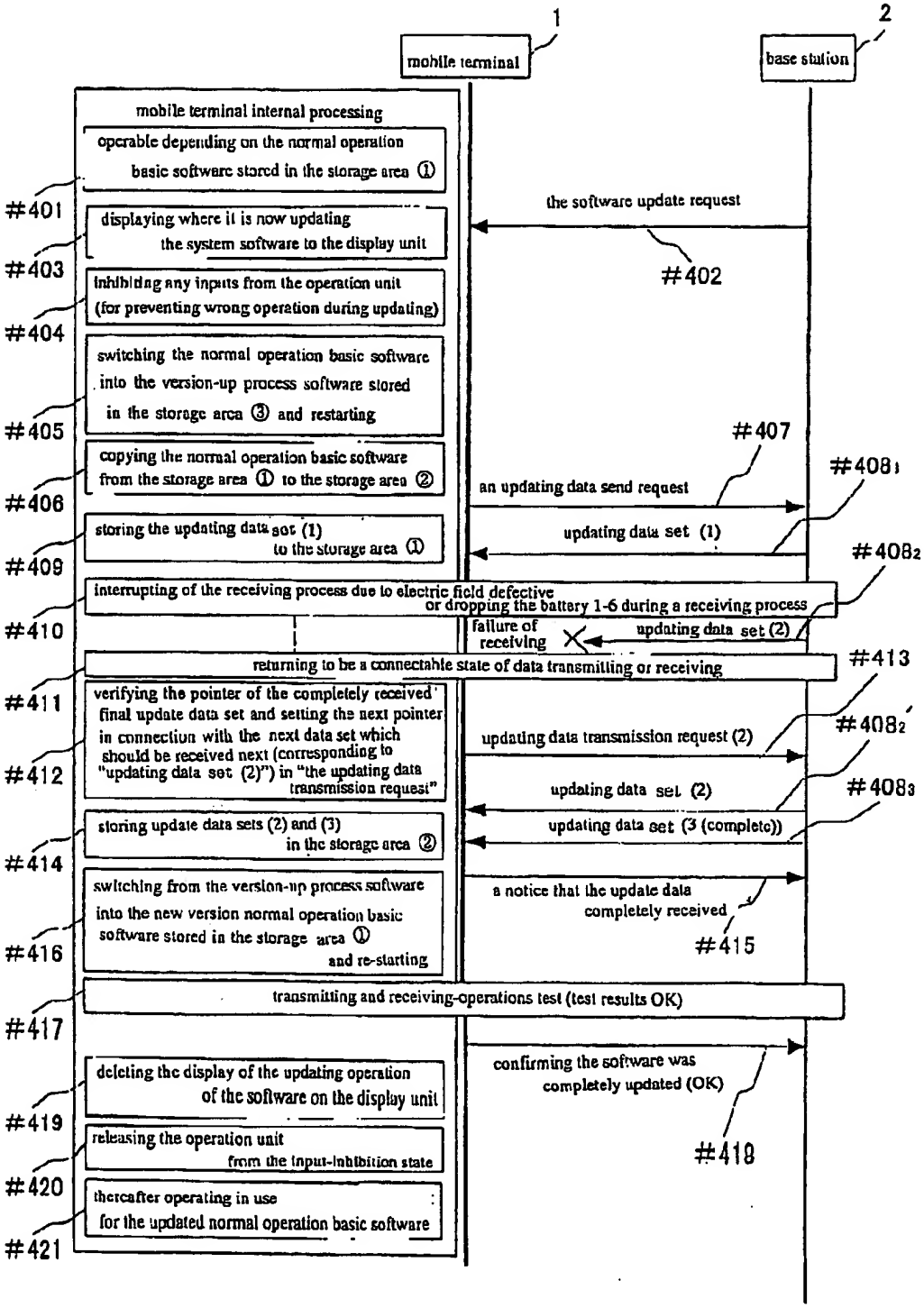
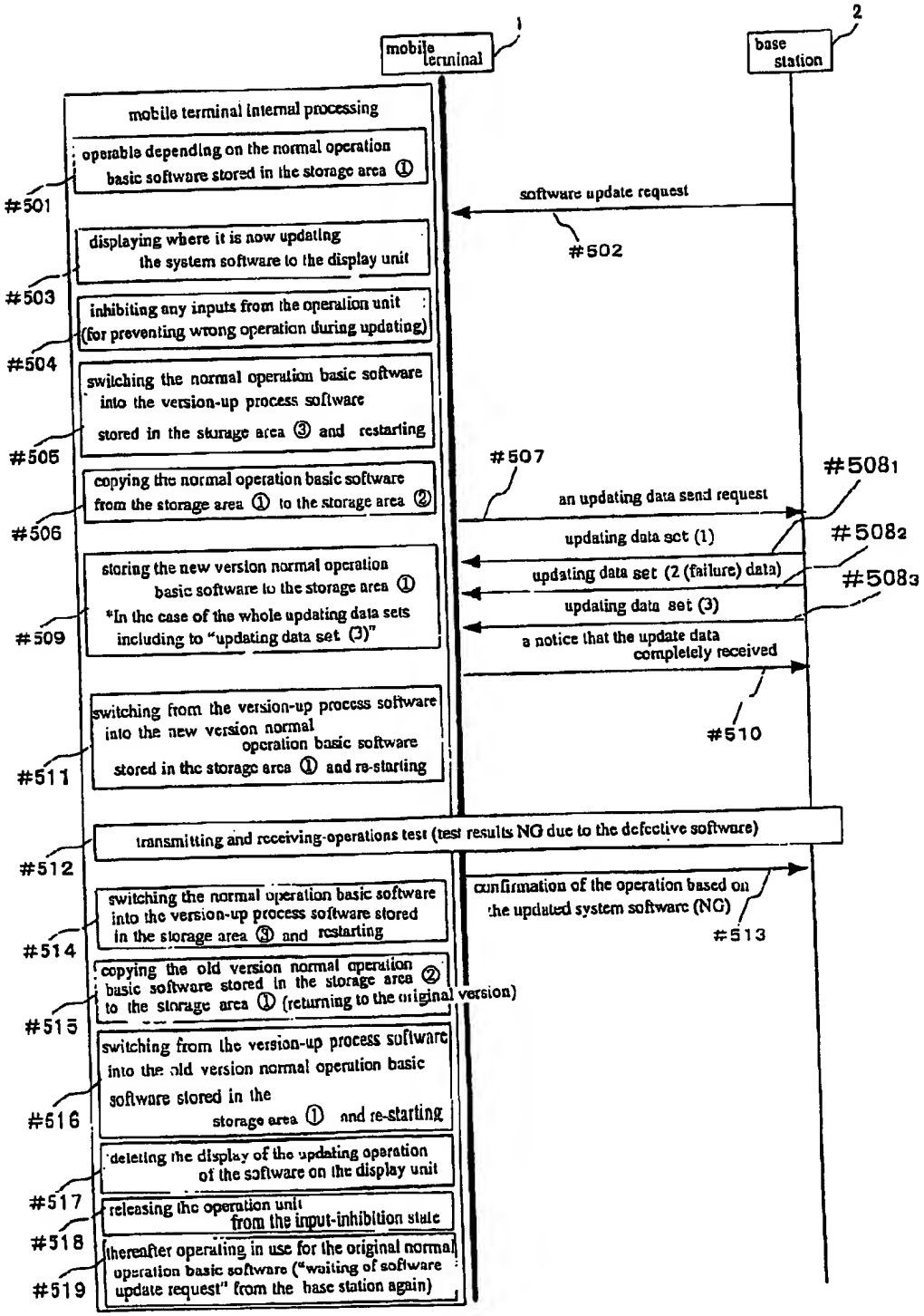

1
mobile terminal
2
base station
mobile terminal internal processing
operable depending on the normal operation basic software stored in the storage area ①
#401
displaying where it is now updating the system software to the display unit
#403
inhibiting any inputs from the operation unit (for preventing wrong operation during updating)
#404
switching the normal operation basic software into the version-up process software stored in the storage area ③ and restarting
#405
copying the normal operation basic software from the storage area ① to the storage area ②
#406
storing the updating data set (1) to the storage area ①
#409
interrupting of the receiving process due to electric field defective or dropping the battery 1-6 during a receiving process
#410
returning to be a connectable state of data transmitting or receiving
#411
verifying the pointer of the completely received final update data set and setting the next pointer in connection with the next data set which should be received next (corresponding to "updating data set (2)") in "the updating data transmission request"
#412
storing update data sets (2) and (3) in the storage area ②
#414
switching from the version-up process software into the new version normal operation basic software stored in the storage area ① and re-starting
#416
transmitting and receiving-operations test (test results OK)
#417
deleting the display of the updating operation of the software on the display unit
#419
releasing the operation unit from the input-inhibition state
#420
thereafter operating in use for the updated normal operation basic software
#421
the software update request
#402
#407
an updating data send request
#408₁
updating data set (1)
#408₂
failure of receiving
updating data set (2)
#413
#408₂
updating data transmission request (2)
updating data set (2)
#408₃
updating data set (3 (complete))
a notice that the update data completely received
#415
confirming the software was completely updated (OK)
#418

FIG. 5


mobile terminal
1
base station
2
mobile terminal internal processing
operable depending on the normal operation basic software stored in the storage area ①
#501
software update request
#502
displaying where it is now updating the system software to the display unit
#503
inhibiting any inputs from the operation unit (for preventing wrong operation during updating)
#504
switching the normal operation basic software into the version-up process software stored in the storage area ③ and restarting
#505
#507
#5081
copying the normal operation basic software from the storage area ① to the storage area ②
#506
an updating data send request
#5082
updating data set (1)
updating data set (2 (failure) data)
#5083
updating data set (3)
storing the new version normal operation basic software to the storage area ①
*In the case of the whole updating data sets including to "updating data set (3)"
#509
a notice that the update data completely received
#510
switching from the version-up process software into the new version normal operation basic software stored in the storage area ① and re-starting
#511
transmitting and receiving-operations test (test results NG due to the defective software)
#512
confirmation of the operation based on the updated system software (NG)
#513
switching the normal operation basic software into the version-up process software stored in the storage area ③ and restarting
#514
copying the old version normal operation basic software stored in the storage area ② to the storage area ① (returning to the original version)
#515
switching from the version-up process software into the old version normal operation basic software stored in the storage area ① and re-starting
#516
deleting the display of the updating operation of the software on the display unit
#517
releasing the operation unit from the input-inhibition state
#518
thereafter operating in use for the original normal operation basic software ("waiting of software update request" from the base station again)
#519

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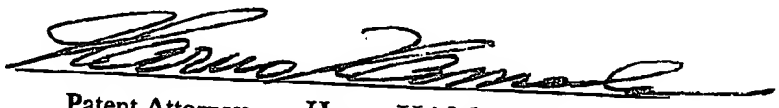
# VERIFICATION OF THE TRANSLATION

I, the below-named Chartered Patent Attorney of Tokyo Japan having an office at an address stated below, hereby declare that :

I am knowledgeable in the English and Japanese languages, and I believe that the attached English translation of the Japanese Patent Application No. 2000-340068 filed on November 8, 2000 is a truc and complete translation of said application.

I also hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of thc United States Code, and that such willful false statements may jeopardize thc validity of the application or any patent issuing thereon.

Date : August 27, 2004



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(English Translation)

# PATENT OFFICE
# JAPANESE GOVERNMENT

This is to certify that the annexed is a true copy of the following application as filed with this Office.

Date of Application : November 8, 2000
Application Number : Japanese Patent Application No. 2000-340068
Applicant : NEC Saitama Ltd.

September 14, 2001

Commissioner,
Patent Office

Kozo OIKAWA

| | |
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| [Account No.] | 006194 |
| [Official Fee Paid] | 21000 |
| [List of Attached Document] | |
| [Kind of Document] | Specification 1 copy |
| [Kind of Document] | Drawings 1 copy |
| [Kind of Document] | Abstract 1 copy |
| [Number of General Power of Attorney] | 9100043 |
| [Proofreading] | Required |

[Kind of Document] Specification
[Title of the prevent Invention]
MOBILE TERMINAL DEVICE AND METHOD OF UPDATING PROGRAM
[Claim(s)]
[Claim 1]

A method of updating a program in a terminal device wherein update data are transmitted from a base station through a radio section to a terminal device for updating a program stored in the mobile terminal device, characterized in that if the transmission is interrupted due to any disconnection between the radio section, then after it is verified that the terminal device becomes connected to the base station, the updating data send request from the terminal device to the base station is performed and said transmission process is re-started for remaining parts of the update data after interrupting of the connection between the radio section.

[Claim 2]

A method of updating a program in a terminal device wherein update data are transmitted from a base station through a radio section to a terminal device for updating a program stored in the mobile terminal device, characterized in that said update data are divided into a plurality of data sets by said base station and said plural data sets are added with sequential pointers respectively, if the transmission is interrupted due to any disconnection between the radio section, then after it is verified that the terminal device becomes connected to the base station, the updating data send request from the terminal device to the base station is performed and after one with a next pointer for said remaining data set is confirmed, then the data set with the next pointer is first transmitted during said re-transmission processes.

[Claim 3]

A method of updating a program in a terminal device wherein update data are transmitted from a base station through a radio section to a terminal device for updating a program stored in the mobile terminal device, wherein after all of said update data are transmitted, then an operation test is automatically started.

[Claim 4]

The method as claimed in claim 3, wherein the program before updating is once moved as an old version and if updated program includes any defectiveness as a result of the test, said updated program is re-written into said old version program existent in said mobile terminal.

[Claim 5]

A terminal device including :

a receiving unit for receiving update data transmitted from a base station through a radio section;

an updating unit for receiving said update data from the base station and updating an existent program with said update data ; and

a re-starting unit for re-starting transmission process of remaining non-transmitted parts of the update data, after it is verified that the terminal device becomes connected to the base station and the update data send request from the terminal device to the base station is performed, if a transmission of update data from a base station to a terminal device is interrupted due to any disconnection between them.

[Claim 6]

A terminal device including :

a receiving unit for receiving update data transmitted from a base station through a radio section whereby said update data are divided into a plurality of data sets

and said plural data sets are added with sequential pointers respectively;

an updating unit for receiving said update data from the base station and updating an existent program with said update data ; and

a re-starting unit for re-starting transmission process of remaining non-transmitted parts of the update data after one with a next pointer for said remaining data set is confirmed and then the data set with the next pointer is first added, after it is verified that the terminal device becomes connected to the base station and the update data send request from the terminal device to the base station is performed, if a transmission of update data from a base station to a terminal device is interrupted due to any disconnection between them.

[Claim 7]

A terminal device including :

a receiving unit for receiving update data transmitted from a base station through a radio section;

an updating unit for receiving said update data from the base station and updating an existent program with said update data ; and

an additional unit wherein after all of said update data are transmitted, then an operation test is automatically started.

[Claim 8]

The device as claimed in claim 7, further including :

a moving unit for moving the pre-updated program as an old version; and

a re-writing unit for re-writing said updated program into said old version program existent in said mobile terminal if updated program includes any defectiveness as a result of the operation test.

[Detail Description of Invention]

[0001]

[Field of the Invention]

The present invention relates to a mobile terminal device and a method of updating a program stored therein in which update data are transmitted from a base station through a radio section to a mobile terminal device for updating a program stored in the mobile terminal device to obtain the new version of the program, wherein the program may, for example, be a system software for transmitting and receiving radio signals.

[0002]

[Background of the Invention]

The update data has been transmitted from a base station through a radio section to a mobile terminal device (just as a mobile terminal) for updating a program stored in the mobile terminal device to obtain the new version of the program (namely version-up), wherein the program may, for example, be a system software for transmitting and receiving radio signals. Japanese laid-open patent publications Nos. 11-239094 and 11-298959 disclose the conventional methods of updating the program stored in the mobile terminal to obtain the new version of the program.

[0003]

First one of the methods for updating the program stored in the mobile terminal device is that the entirety of the program is updated. Second one of the updating methods is that only a difference between the old version of the program stored in the mobile terminal and the new version of the program is selectively updated. In either of the methods, the updated data transmitted from the base station through the radio section are down-loaded into the mobile terminal for updating the program stored

in the mobile terminal.

[0004]

[Issue to be solved by the Invention]

A communication between the base station and the mobile terminal may be interrupted due to any defect of the electric field on the radio section or a voltage drop of a battery power of the mobile terminal. If a disconnection between the base station and the mobile terminal appears in the radio section during the transmission of the update data from the base station to the mobile terminal, then the transmission of the update data of the program stored in the mobile terminal is incomplete. In accordance with the conventional updating methods, if the download of the update data into the mobile terminal is incomplete due to any interruption of the transmission, then the communication system do over the transmission of the update data again after recovering the transmission. This conventional method is the time-consuming method for updating the program if the interruption of the transmission appears.

[0005]

Even if the download of the update data into the mobile terminal is complete, and if the downloaded data include any defective data, then the updated program performs an abnormal function in the mobile terminal. When such the abnormal condition appears, the actual execution of the updated program makes it possible to verify whether the updated program is defective or non-defective. The conventional methods are enable to verify whether the updated program is defective or non-defective without actual execution of the updated program. If the defectiveness of the updated program could be verified after the actual execution of the updated program, then it is necessary to again download the updated program into the mobile terminal. This procedure is the time-consuming method for updating the program.

[0006]

Accordingly, it is an object of the present invention to provide a novel method of updating the program stored in the mobile terminal free from the above problems. Namely, it is the object of the present invention to provide a novel method of updating the program stored in the mobile terminal, which may perfect the update process efficiently even if the connection in the radio section is interrupted.

[0007]

[Issue to be solved by the Invention]

For achieving such the object, a first aspect of the present invention (the invention as recited in the claim 1) is a method of updating a program in a terminal device, wherein if a transmission of update data from a base station to a terminal device is interrupted due to any disconnection between them, then after it is verified that the terminal device becomes connected to the base station, the transmission process is required from the mobile terminal device to the base station and then re-started for remaining parts of the update data after interrupting of the connection between the radio section.

According to the above invention, if a transmission of update data from a base station to a terminal device is interrupted due to any disconnection between them, then after it is verified that the terminal device becomes connected to the base station, the transmission process is re-started for remaining parts of the update data after interrupting of the connection between the radio section.

[0008]

A second aspect of the present invention (the invention as recited in the claim 2) is a method of updating a program in a terminal device, wherein said update

data are divided into a plurality of data sets by said base station and said plural data sets are added with sequential pointers respectively, if the transmission is interrupted due to any disconnection between the radio section, then after it is verified that the terminal device becomes connected to the base station, the updating data send request from the terminal device to the base station is performed and after one with a next pointer for said remaining data set is confirmed, then the data set with the next pointer is first transmitted during said re-transmission processes.

According to the above invention, if a transmission of update data from a base station to a terminal device is interrupted due to any disconnection between them, after it is verified that the terminal device becomes connected to the base station, the transmission process is re-started for remaining non-transmitted part of update data after one for the interrupting of the connection between the radio section.

[0009]

A third aspect of the present invention (the invention as recited in the claim 3) is a method of updating a program in a terminal device, when update data are transmitted from a base station through a radio section to a terminal device for updating a program stored in the mobile terminal device, then an operation test is automatically started.

According to the above invention, when a program is updated, then an operation test is immediately started.

[0010]

A fourth aspect of the present invention (the invention as recited in the claim 4) is the method as claimed in claim 3, wherein the normal operation basic software is once moved as an old version and if updated program includes any defectiveness as a result of the operation test, said updated program is re-written into said old version program existent in said mobile terminal.

According to the above invention, when updated program includes any defectiveness as a result of the operation test, said updated program is re-written into said old version program existent in said mobile terminal.

[0011]

The fifth to eighth aspects of the present invention (the invention as recited in the claims 5-8) are terminal devices for operating the method of updating a program according to the above mentioned first to fourth inventions.

The program for updating could be installed in the terminal device and it could not be limited to a system software for transmitting and receiving radio signals.

Further, as to the update data from the base station to the mobile terminal through a radio section, the entirety of the new version of the program is updated or it is, off course, possible that only a difference between the old version of the program stored in the mobile terminal and the new version of the program is selectively updated.

[0012]

[Mode for carrying out the Invention]

Preferred embodiments according to the present invention will be described in detail with reference to the accompanying drawings. FIG. 1 is a schematic view illustrative of a radio communication system for performing a program-updating operation in a first embodiment in accordance with the present invention. In FIG. 1, a reference number 1 is a mobile terminal and a reference 2 is a base station. The mobile terminal 1 is connected through a radio section 3 to the base station 2.

[0013]

The mobile terminal 1 may include a transmitter unit 1-1, a receiver unit 1-2,

a processor unit 1-3, a display unit 1-4, an operational unit 1-5, and a battery 1-6. The processor unit 1-3 may further include a first storage area 1A (storage area ①), a second storage area 1B (storage area ②), a third storage area 1C (storage area ③), and an arithmetic unit 1D.

[0014]

Basic software for the transmission (stated as a normal operation basic software) is stored in a storage area 1A. A software for processing a version-up (stated as a version-up process software) is stored in a storage area 1C. The storage area 1B is a save area for the normal operation basic software stored in the storage area 1A.

[0015]

[Updated into a new version: normal operation]

In accordance with the radio communication system, the normal operation basic software stored in the storage area 1A in the mobile terminal 1 may be updated into a new version from a base station 2 as follows.

[0016]

In the mobile terminal 1, the arithmetic unit 1D is operable deepening on the normal operation basic software stored in the storage area 1A (#301 of FIG. 3). In this state, "the software update request" is sent from the base station 2 through the radio section 3 to the mobile terminal 1 (#302). The arithmetic unit 1D instructs the display unit 1-4 to display where it is now updating the system software (#303). The arithmetic unit 1D further inhibits any input from the operation unit 1-5 and also any operations by user for preventing wrong operation during updating (#304).

[0017]

The arithmetic unit 1D switches the normal operation basic software stored in the storage area 1A into the version-up process software stored in the storage area 1B and restarting (#305). After restart, the arithmetic unit 1D copies the normal operation basic software from the storage area 1A to the storage area 1B (#306), whereby the normal operation basic software is once moved to the second storage area 1B as an old version (Refer to FIG. 2(a)).

[0018]

Next, the arithmetic unit 1D sends "an updating data send request" from the transmitter unit 1-1 through the radio section 3 to the base station 2 (#307). The base station 2 receives "the updating data send request" from the mobile terminal 1. After the preparation of the download of the new version normal basic system software is verified by the base station 2 in the mobile terminal 1, the base station 2 sends updating data to the mobile terminal 1 (#308).

[0019]

In this embodiment, the base station 2 divides the new version normal operation basic software into first, second and third updating data sets (1), (2) and (3). The first, second and third updating data sets (1), (2) and (3) are respectively added them with pointers which indicate sequences ($\#308_1$), ($\#308_2$) and ($\#308_3$) and transmitted.

[0020]

The mobile terminal 1 receives the first, second and third updating data sets (1), (2) and (3) from the base station 2 sequentially (#309). The first storage area 1A stores the first, second and third updating data sets (1), (2) and (3) into the first storage area 1A, whereby (the old version) normal operation basic software stored in the storage area 1A is rewritten into the new version normal operation basic software (Refer to FIG. 2 (b)).

[0021]

After the new version normal operation basic software has been stored into the first storage area 1A, the arithmetic unit 1D sends "a notice that the update data completely received" to the base station 2 (#310), whereby the process for receiving the update data is completed. The base station 2 is notified from the mobile terminal 1 by another notice that the new version normal operation basic software has completely been downloaded.

[0022]

After sending "the notice of the receipt of the update data" to the base station 2, the arithmetic unit 1D of the mobile terminal 1 switches in use from the version-up process software stored in the storage area 1C into the downloaded new version basic software stored in the first storage area 1A and re-start (#311). After the re-start, the arithmetic unit 1D conducts the basic operation test in cooperation with the base station 2 such as the basic operations, for examples, transmission and receiving-operations for confirmation of the operation based on the updated system software (#312). If the operation test verifies that the operation is completely correct (OK), then the arithmetic unit 1D sends the base station 2 a notice that "the software was completely updated (OK)" (#313).

[0023]

Then, the arithmetic unit 1D deletes the display of the updating operation on the display unit 1-4 (#314). The arithmetic unit 1D releases the operation unit 1-5 from the input-inhibition state (#315). The updated normal operation basic software stored in the storage area 1A is used (#316).

[0024]

[version-up: abnormal ①]

If the connection between the mobile terminal 1 and the base station 2 is disconnected in the radio section 3 due to any reason such as the field defect or the power voltage drop of the battery 1-6 of the mobile terminal 1 during the update data transmission from the base station 2, then the mobile terminal 1 operates as FIG. 4 that is a flow chart showing sequential operations of the above communication system.

[0025]

Each operation of #401 to 406 corresponding to #301 to 306 as shown in FIG. 3 has operated. The arithmetic unit 1D sends "an updating data send request" from the transmitter unit 1-1 (#407). The base station 2 receives the updating data send request. In this embodiment, the base station 2 divides the new version normal operation basic software into first, second and third updating data sets (1), (2) and (3). The first, second and third updating data sets (1), (2) and (3) are respectively added with pointers which indicate sequences and restart to transmit from the updating data set (1) ($\#408_1$).

[0026]

The arithmetic unit 1D of the mobile terminal 1 receives the updating data set (1) from the base station 2. The first storage area 1A stores the first updating data set (1) into the first storage area 1A (#409). The disconnection between the mobile terminal 1 and the base station 2 appears in the radio section 3 due to electric field defective or dropping the battery 1-6, whereby the receiving process by the mobile terminal 1 is interrupted (#410). The mobile terminal 1 does not receive the second updating data set (2) ($\#408_2$) and could not receive the following updating data set from the base station 2.

[0027]

When the radio section becomes connectable state (#411), namely the electric field of the radio section 3 becomes good state or the battery 1-6 becomes power

up, the arithmetic unit 1D verifies the pointer of the completely received final update data set and decides the next pointer in connection with the next data set which should be received next. This next pointer of the second update data set (2) is set in "the updating data transmission request" (#412) and sends the "the updating data transmission request" to the base station 2 (#413).
[0028]

The base station 2 receives "the updating data transmission request" with the next pointer from the mobile terminal 1. The data transmission is re-started from the second update data set (2) which is added with the next pointer, namely, could not send the request to the mobile terminal 1 at the prior $\#408_2$ ($\#408_2$').
[0029]

The arithmetic unit 1D of the mobile terminal 1 receives the second and third update data sets (2) and (3) ($\#408_2$', $\#408_3$) transmitting from the base station 2, and then stores the second and third update data sets (2) and (3) in the first storage area 1A (#414). The first, second and third storage areas (1), (2) and (3) are completely stored in the first storage area 1A (#414). The stored normal operation system software (the old version system software) is re-written into the new version of the normal operation system software.
[0030]

In the following, the operations of #415, 416, 417, 418, 419, 420 are carried out against #310, 311, 312, 313, 314, 315 and then the arithmetic unit 1D switches in use from the normal operation system software into the downloaded new version system software stored in the first storage area 1A (#421).
[0031]

[updated data: defective ②]

If the update data from the base station 2 includes any defective data, for example, update data including any defective data such as erroneous data through the radio section 3 are downloaded and then the normal operation system software stored in the storage area 1A is rewritten, the mobile terminal 1 operates as shown in the sequences of FIG. 5. In this embodiment, when the update data set (2) is transmitted at $\#508_2$, the update data set (2) includes any defective data.
[0032]

After operating of #501~511 corresponding to #301~311, the arithmetic unit 1D of the mobile terminal 1 conducts the basic operation test in cooperation with the base station 2 such as the basic operations, for examples, transmission and receiving-operations for confirmation of the operation based on the updated system software (#512). In this case when transmitting the update data set (2) at the prior $\#508_2$, the update data set (2) includes any defective data so that the result of the test is "defective NG".
[0033]

According to this result of the test, the arithmetic unit 1D sends the base station 2 a notice "confirmation of the operation based on the updated system software (NG)" that the result of the test is NG (#513). The arithmetic unit 1D switches the normal operation system software stored in the storage area 1A into the updating operation system software in the storage area 1C and restarting (#514).
[0034]

After restart, the arithmetic unit 1D uses the updating operation system software and then readouts and copies the operated old version of the normal operation system software backed up in the storage area 1B to the first storage area 1A (#515),

whereby the new-version normal operation system software that is stored in the storage area 1A and judged as defective is rewritten to the old-version software and returned to the original version.

[0035]

After the notice of the receipt of the update data to the base station 2, the arithmetic unit 1D switches in use from the update operation system software stored in the third storage area 1C into the downloaded new version system software stored in the first storage area 1A (#516) and re-start. The arithmetic unit 1D deletes the display of the updating operation on the display unit 1-4 (#517). The arithmetic unit 1D releases the operation unit 1-5 from the input-inhibition state (#518). The non-updated normal operation system software is used (#519).

[0036]

[Search of the mobile terminal from the base station]

If the mobile terminal 1 for a user becomes defective such as the defective transmitting and receiving under the specific condition, a sound intermittent and defective data communication, it becomes necessary to solve the defective by improvement of the software in the mobile terminal 1. For avoiding the miss-matching with the non-use state of the mobile terminal for a user, the base station retrieves the mobile terminal which have been in the non-use state for a predetermined time period or longer.

[0037]

If there are the mobile terminal which have been in the non-use state for a predetermined time period or longer, the base station 2 downloads the update data to the retrieved mobile terminal in accordance with the above-described sequential processes shown in FIG. 3 and proceeds the up-dating process of the normal operation system software. The base station 2 registers the completion of the processes from the mobile terminal 1. The base station 2 retrieves again another mobile terminal 1 which has been in the non-use state for a predetermined time period or longer.

[0038]

If the disconnection of the radio section 3 appears during the downloading process of the update data set, the downloading process of the mobile terminal 1 and the base station 2 is again established in accordance with the sequence shown in FIG. 4. Further, when the downloading process of the update data is completed and the problems are occurred in the basic operation test, the mobile terminal 1 is carried out by rewriting the normal basic software into the old-version software in accordance with the sequence of FIG. 5.

When the mobile terminal which is rewritten into the old-version software has been in the non-use state for a predetermined time period or longer, the requirement of updating the data from the base station 2 is occurred again and the up-dating process is carried out.

[0039]

As described above, according to the present embodiment if the disconnection of the radio section 3 between the mobile terminal 1 and the base station 2 appears during the downloading process (in the case of abnormal ①), then after the connection of the radio section 3 is again established, then the non-received next data sets are downloaded to the mobile terminal without re-downloading the once received data set. It is possible that the normal operation basic software is subjected to the up-dating process efficiently or rapidly.

[0040]

Further, according to the present invention, subsequent to the complete download of the entirety of the normal operation software in the mobile terminal 1 by the update data from the base station 2, then the operation test is made to the updated normal operation basic software. Therefore, if the updated software is defective (in the case of defective ②), then the re-transmitting the update data from the base station 2 is rapid so that it is possible that the normal operation basic software of the mobile terminal 1 is subjected to the up-dating process efficiently or rapidly.

[0041]

Further, according to the present invention, in the case of defective ② the normal operation basic software is rewritten into the old-version software, whereby the mobile terminal 1 becomes operable even in the old-version software. Further, in the case of defective ② when there is the radio section 3 which has been in the non-use state for a predetermined time period or longer, the base station 2 downloads the update data again, namely, subsequent to the defective up-dating process, the next updating process is not carried out so that the mobile terminal 1 is applicable for a long time.

[0042]

Further, in the foregoing descriptions, the entirety of the system software is re-written into the new version one. It is, off course, possible that the different part of the system software between the new and old versions is selectively subjected to the up-dating process efficiently. Since the update data comprises only the different part, it is possible to reduce the capacity of the storage area in the side of the mobile terminal 1, the downloading time and space of the path of the radio section 3.

According to the above embodiment, the software (program) having the up-dating process in the mobile terminal 1 is a normal operation basic software, however, the present invention is also applicable to the other software than the system software.

[0043]

[Effects of the Invention]

In the foregoing descriptions, according to the present invention, if a transmission of update data of the radio section from a base station to a terminal device is interrupted due to any disconnection between them, then after it is verified that the terminal device becomes connected to the base station, the remaining parts of the update data from the non-received data due to the interruption is transmitted to the mobile terminal (the first and the fifth inventions). Further, if a transmission of update data of the radio section from a base station to a terminal device is interrupted due to any disconnection between them, then after it is verified that the terminal device becomes connected to the base station, the update data from the non-received data next to the last received update data at the interruption is transmitted to the mobile terminal (the second and the sixth inventions), whereby the updating of the program could be rapidly and efficiently carried out without re-starting the transmission of the update data set.

[0044]

Further according to the present invention (the third and seventh inventions), after all of said update data are transmitted, then an operation test is automatically started and as the result the re-transmission process of the update data from the base station is advanced whereby the updating of the program could be rapidly and efficiently carried out.

Further according to the present invention (the fourth and eighth inventions), if updated program includes any defectiveness, said updated program is re-written into said program of the old version so that it could be avoided that the mobile terminal becomes a defective and also prepared with the next transmission of the update data

from the base station under the normal condition.

[Brief Description of Drawing]

[FIG.1]

FIG. 1 is a schematic view illustrative of a radio communication system for performing a program-updating operation in a first embodiment in accordance with the present invention.

[FIG.2]

FIG. 2 is a schematic view illustrative of moving the old version of the normal operation basic software from the first storage area ① to the second storage area ② and storing the new version of the normal operation basic software to the first storage area ①.

[FIG. 3]

FIG. 3 is a flow chart showing sequential operations of the updating process of the normal operation basic software between the mobile terminal and the base station if the updating process is successful.

[FIG. 4]

FIG. 4 is a flow chart showing sequential operations of the updating process of the normal operation basic software between the mobile terminal and the base station if the updating process is completed in case of the defective ① (disconnection during the update data transmission).

[FIG. 5]

FIG. 5 is a flow chart showing sequential operations of the updating process of the normal operation basic software between the mobile terminal and the base station if the updating process is completed in case of the defective ② (that the update data includes any defective data).

[Description of symbols]

1...a mobile terminal 2...a base station 3...a radio section 1-1...a transmitter unit 1-2...a receiver unit 1-3...a processor unit 1-4...a display unit 1-5...an operational unit 1-5 1-6...a battery 1A...a first data storage area (storage area ①) 1B...a second storage area (storage area ②) 1B...a second storage area (storage area ③)

[Kind of Document] Abstract
[Abstract]
[Object] An object of the present invention is to update a program rapidly and efficiently.
[Means]
If the transmission is interrupted due to any disconnection between the radio section such as electric field defective or voltage drop of the battery in the mobile terminal 1during the transmission of the update data from the base station 2 (#410), then after it is verified that the terminal device becomes connected to the base station (#411), after one with a next pointer for said remaining data set is confirmed, then the data set with the next pointer is first transmitted during said re-transmission processes (#413, #$408_2$',#$408_3$).
[Selected Drawing] FIG.4